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L.103.575

# PATENT SPECIFICATION

DRAWINGS ATTACHED

L.103.575

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## COMPLETE SPECIFICATION

### Improvements in or relating to Collapsible Shelters

We, FRANKENSTEIN GROUP LIMITED, a British Company, of Victoria Rubber Works, Newton Heath, Manchester 10, in the County of Lancaster, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a collapsible shelter of the type having a flexible canopy which is tensioned by means of flexible cables running through the edges thereof and/or supporting such canopy in ridged formation.

In a shelter of the type referred to, the (or each) tensioning cable acquires a substantially parabolic curvature whereby the forces applied to the canopy are distributed approximately uniformly, but the natural tendency of the canopy material to ride along the cable towards the crest of its curve may give rise to local stresses in cases where such material is fixed to the cable.

These are not serious with canopies of small area and made of plastics-coated fabric, since a compatible sheath or coating adherent to the cable may then be bonded directly to the canopy or within a tunnel of similar material united thereto.

With normal tentage fabrics, however, location of the tensioning cable has hitherto been effected by the traditional sailmaking technique of rolling or folding it within the canopy material and sewing it in place by whipping over with strong thread.

This method, however, is inappropriate with the lighter fabrics required for ready transportation of large shelters in dismantled condition, since the tensioning forces acting along the cable may be sufficient progressively to rupture the stitching and possibly to so damage the enclosing fabric that the cable can tear free thereof.

The object of the present invention is to enable a light fabric canopy to be heavily tensioned over, or through the medium of, a cable

without risk of damage to itself or any tendency to ride up as aforesaid.

According to this invention, a collapsible shelter of the type referred to is characterised in that the (or each) part of the canopy traversed by a tensioning cable is formed into or provided with a fabric tunnel containing said cable and also a heavy webbing reinforcement whose ends protrude from said tunnel and are anchored to said cable or independently thereof, said reinforcement being connected directly or indirectly to the interior of said tunnel so as to be interposed at all times between said cable and that side of said tunnel upon which said cable bears when tensioned.

In the accompanying drawings:—

Fig. 1 is a fragmentary plan view of a shelter canopy tensioned by peripheral cables in accordance with the present invention;

Fig. 2 is an enlarged section on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary perspective view showing a supporting cable imparting a ridge formation to the tensioned canopy; and

Fig. 4 is a section on the line 4—4 of Fig. 3.

In the example illustrated in Figs. 1 and 2, the invention is shown applied to a collapsible shelter of the form described and claimed in the Specification of our prior Patent Application No. 21621/64 (Serial No. 1,049,904): that is to say, one in which a flexible canopy is formed into substantially equally-spaced radiating ridges by mutually-connected supporting cables and by the pull of tensioned edging cables whereby the parts of its periphery intermediate said supporting cables are formed into substantially parabolic arches.

Each such peripheral part of the canopy is cut to a shape based upon a parabola but modified slightly to allow for its angular relationship to other parts of the canopy periphery and the fact that the slopes of such canopy are non-planar.

The resulting curved edge 1 may be folded over to form a tunnel from end to end thereof, but preferably the tunnel effect is achieved by the attachment of a suitably developed fabric sleeve 12 thereto by spaced lines of stitching 13, 14.

Extending lengthwise of this sleeve 12 are two superimposed webbings 15, 16 sewn medially of backing strips 17, 18 respectively, the edges of the outer strip 17 being sewn to the sides of the sleeve at 19 whilst those of the strip 18 are sewn to the strip 17 at 20, or directly to the sides of the sleeve.

Both backing strips are arranged with sufficient fullness to ensure that, under the pull of a tensioned cable 21 led through the sleeve 12, the backing strips 17, 18 will assume a trough form with their webbings 15, 16 lying in contact with one another and with the bight of such sleeve (Fig. 2).

The projecting ends of the cable 21 are connected to ground anchorages 22, as shown in Fig. 1, through the medium of turnbuckles 23 or equivalent means, whilst to ensure that the canopy edge 1 will not ride up the curve of the cable due to the tension component along such edge increasing towards its corners, the ends of the two webbings 15, 16 after emergence from the sleeve 12 are connected to the ground anchorages 22 through the medium of a tensioner 24 and rope guy 25, or alternatively they may be attached directly to the cable 21 through a tensioner.

The cables 21 and webbing reinforcements 15, 16 associated with two juxtaposed tensioned edges 11 of the canopy are crossed over one another and individually secured as shown.

As shown in Figs. 3 and 4, the cables 27 which form the upper part of the canopy 10 into (say) three radiating ridges are conveniently provided at their inner ends with eyes 28 which are bolted at 29 to a common centre-plate 30, such cables being shackled at 31 to further cables 32 which pass over pulleys at the heads of masts and then downwardly to tensioners and ground anchorages.

Since the weight of the canopy 10 necessarily brings the centre-plate 30 below mast-head level, there is a tendency for its ridge portions 33 to ride down their supporting cables 27, and to prevent this each such ridge portion is provided with a double webbing reinforcement 34, 35 corresponding to that previously described.

A backing strip 36 carrying the upper webbing 34 has its edges sewn at 37 to a wider strip 38 backing the lower webbing 35 and having its edges sewn at 39 to the ridge portion 33 which may or may not be an integral part of the canopy 10. Alternatively, both backing strips may be sewn independently to the ridge portion aforesaid.

The weight of the canopy imparts an inverted trough form to each of these backing strips,

and the attachment of the lower strip 38 to its webbing 35 serves to position the latter within a longitudinally split tunnel 40 which accommodates the cable 27, the edges of such tunnel being securable together in any suitable manner; for example, they may be provided respectively with loops 41 and eyelets 42 for connection in the manner known as "Dutch-lacing".

The inner ends of the webbings 34, 35 are attached to plates 43 for connection to the centre-plate bolts 29, whilst their outer ends project beyond the canopy ridge 33 and are connected to the shackles 31 either directly or through the medium of tensioners.

It will be appreciated that, in each of the arrangements above described, the canopy fabric is insulated from the cable 21 or 27 by the interposed webbings, the tensioning load being transmitted by the latter to the canopy through a number of spaced lines of stitching so that there is no risk of the localized tearing which might occur if the webbings were sewn directly to the canopy 10.

#### WHAT WE CLAIM IS:—

1. A collapsible shelter of the type referred to, characterised in that the (or each) part of the canopy traversed by a tensioning cable is formed into or provided with a fabric tunnel containing said cable and also a heavy webbing reinforcement whose ends protrude from said tunnel and are anchored to said cable or independently thereof, said reinforcement being connected directly or indirectly to the interior of said tunnel so as to be interposed at all times between said cable and that side of said tunnel upon which said cable bears when tensioned.

2. A collapsible shelter according to Claim 1, and having adjoining parts of its canopy periphery cut to substantially parabolic curves, further characterised in that the cable-receiving tunnel along each such part is formed by attaching a fabric sleeve thereto along spaced lines.

3. A collapsible shelter according to Claim 2, further characterised by the provision within the sleeve of a tunnel of two superimposed webbing reinforcements sewn medially of separate fabric troughs, the trough adjacent the cable having its edges secured to opposite sides of the other trough or directly to the tunnel.

4. A collapsible shelter according to Claim 1 and having parts of its canopy formed into radiating ridges, further characterised in that the tunnel is split longitudinally to receive the supporting cable, the wall of such tunnel being interposed between the webbing reinforcement and a fabric trough to which such reinforcement is medially attached, the edges of said trough being secured to the canopy.

5. A collapsible shelter according to Claim 4, further characterised by the provision of a second webbing reinforcement and attached fabric trough between the canopy and the first-

mentioned trough, the edges of this second trough being secured directly to the canopy or to the first trough.

6. A collapsible shelter substantially as described with reference to, and as shown in, Figs. 1 and 2 or Figs. 3 and 4 of the accompanying drawings.

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COMPLETE SPECIFICATION

1 SHEET

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